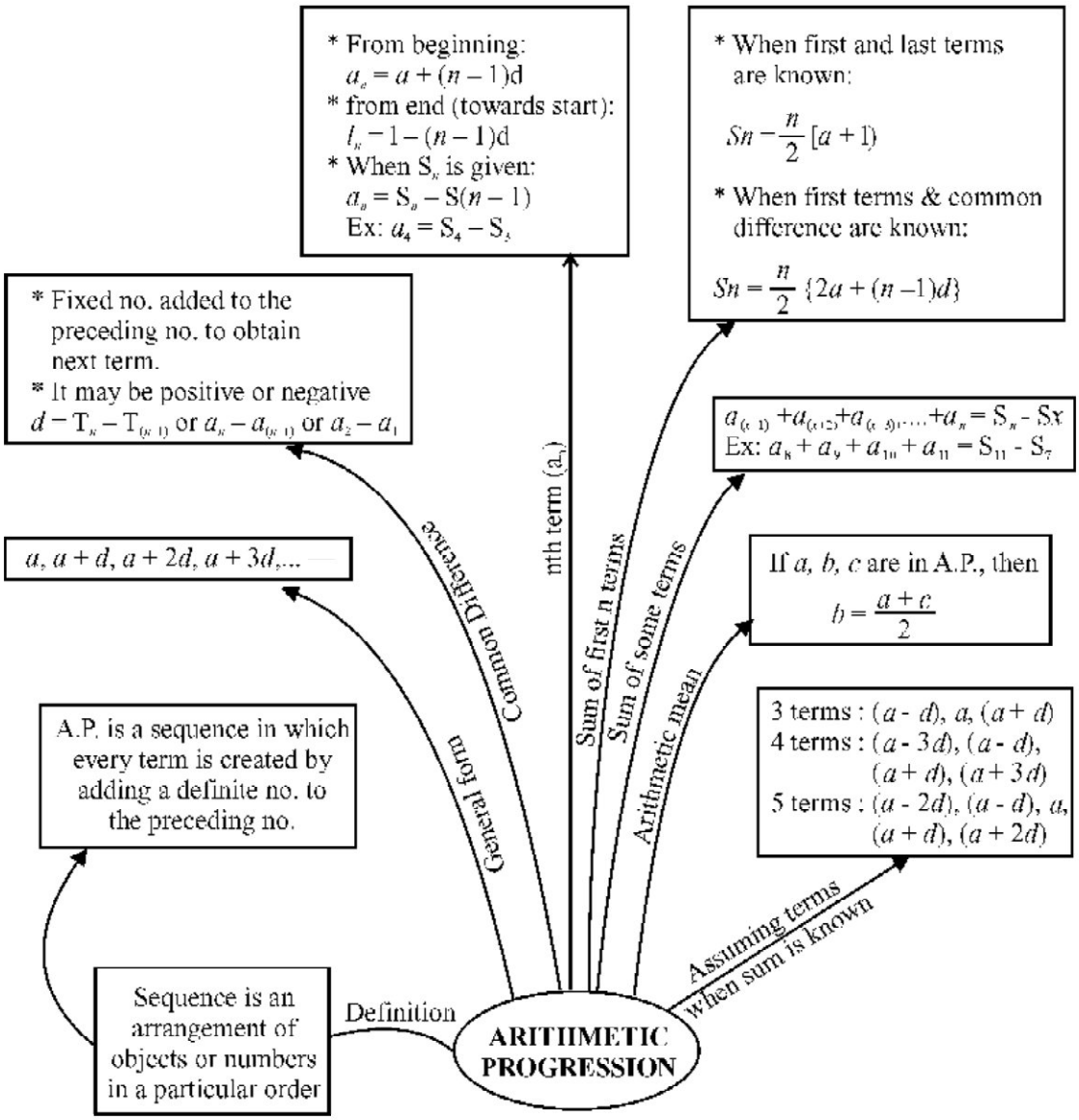
CHAPTER

5 Arithmetic Progression



* $a \rightarrow$ first term, $d \rightarrow$ common difference; $a_n \rightarrow n^{th}$ term; S_n Sum of first n terms; $l \rightarrow$ last term

VERY SHORT ANSWER TYPE QUESTIONS

1. Find 5^{th} term of an A.P. whose n^{th} term is $3n - 5$

2. Find the sum of first 10 even numbers.

3. Write the n^{th} term of odd numbers.

4. Write the sum of first n natural numbers.

5. Write the sum of first n even numbers.

6. Find the n^{th} term of the A.P. $-10, -15, -20, -25, ...$

7. Find the common difference of A.P. $4\frac{1}{9}, 4\frac{2}{9}, 4\frac{1}{3}, ...$

8. Write the common difference of an A.P. whose n^{th} term is $a_n = 3n + 7$

9. What will be the value of $a_8 - a_4$ for the following A.P.

$4, 9, 14, ..., 254$

10. What is value of a_{16} for the A.P. $-10, -12, -14, -16, ...$

11. $3, k - 2, 5$ are in A.P. find k.

12. For what value of p, the following terms are three consecutive terms of an A.P.

$\frac{4}{5}, p, 2.$

13. Determine the 36^{th} term of the A.P. whose first two terms are –3 and 4 respectively.

14. Multiple Choice Questions:

(i) 30^{th} term of the A.P. 10, 7, 4 .... is

(a) 97 (b) 77

(c) –77 (d) –87

(ii) 11^{th} term of an A.P. $-3, -\frac{1}{2}, , ...$ is

(a) 28 (b) 22

(c) –38 (d) $-48\frac{1}{2}$

(iii) In an A.P. if $d = -4$, $n = 7$, $a_n = 4$, then a is

(a) 6 (b) 7

(c) 120 (d) 28

(iv) The first three terms of an A.P. respectively are $3y - 1$, $3y + 5$ and $5y + 1$ then y equals: **(CBSE 2014)**

(a) –3 (b) 4

(c) 5 (d) 2

(v) The list of numbers – 10, – 6, – 2, 2, ... is

(a) An A.P. with $d = -16$ (b) An A.P. with $d = 4$

(c) An A.P. with $d = -4$ (d) Not an A.P.

(vi) The 11^{th} term from the last term of an A.P. 10, 7, 4, ..., – 62 is

(a) 25 (b) –32

(c) 16 (d) 0

(vii) The famous mathematician associated with finding the sum of the first 100 natural numbers is

(a) Pythagoras (b) Newton

(c) Gauss (d) Euclid

(viii) What is the common difference of an A.P. in which $a_{18} - a_{14} = 32$?

(a) 8 (b) – 8

(c) – 4 (d) 4

(ix) The nth term of the A.P. $\left(1+\sqrt{3}\right)$, $\left(1+2\sqrt{3}\right)$, $\left(1+3\sqrt{3}\right)$, ... is

(a) $1 + n\sqrt{3}$ (b) $n + \sqrt{3}$

(c) $n\left(1+\sqrt{3}\right)$ (d) $n\sqrt{3}$

(x) The first term of an A.P. is p and the common difference is q, then its 10^{th} term is

(a) $a + 9p$ (b) $p - 9q$

(c) $p + 9q$ (d) $2p + 9q$

SHORT ANSWER TYPE QUESTIONS-I

15. Is 144 a term of the A.P. 3, 7, 11, ... ? Justify your answer.

16. Show that $(a - b)^2$, $(a^2 + b^2)$ and $(a + b^2)$ are in A.P.

17. The first term, common difference and last term of an A.P. are 12, 6 and 252 respectively, Find the sum of all terms of this A.P.

18. Find the sum of first 15 multiples of 8.

19. Find the sum of even positive integers between 1 and 200.

20. If $4m + 8$, $2m^2 + 3m + 6$, $3m^2 + 4m + 4$ are three consecutive terms of an A.P. find m.

21. How many terms of the A.P. 22, 20, 18, ... should be taken so that their sum is zero.

22. If 10 times of 10^{th} term is equal to 20 times of 20^{th} term of an A.P. Find its 30^{th} term.

23. Solve for x: $1 + 4 + 7 + 10 + ... + x = 287$ **(CBSE 2020)**

24. Find how many two digit numbers are divisible by 6? **(CBSE 2011)**

25. If $\frac{1}{x+2}$, $\frac{1}{x+3}$ and $\frac{1}{x+5}$ are in A.P. find x. **(CBSE 2011)**

26. Find the middle term of an A.P. – 6, – 2, 2, ... 58. **(CBSE 2011)**

27. In an A.P. find S_n, where $a_n = 5n - 1$. Hence find the sum of the first 20 terms. **(CBSE 2011)**

28. Which term of A.P. 3, 7, 11, 15 .... is 79? Also find the sum $3 + 7 + 11 + ... + 79$. **(CBSE 2011C)**

29. Find the 15^{th} term from the last term of the A.P. 3, 8, 13, ... 253. **(CBSE 2022)**

SHORT ANSWER TYPE QUESTIONS-II

30. Find the sum of integers between 10 and 500 which are divisible by 7.

31. The sum of 5^{th} and 9^{th} terms of an A.P. is 72 and the sum of 7^{th} and 12^{th} term is 97. Find the A.P.

32. If the m^{th} term of an A.P. be $\frac{1}{n}$ and n^{th} term be $\frac{1}{m}$, show that its $(mn)^{th}$ is 1.

33. If the m^{th} term of *an* A.P. is $\frac{1}{n}$ and the n^{th} terms is $\frac{1}{m}$, show that the sum of mn terms is $\frac{1}{2}(mn+1)$.

34. If the p^{th} term A.P. is q and the q^{th} term is p, prove that its n^{th} term is $(p+q-n)$.
(CBSE 2023)

35. Find the number of natural numbers between 101 and 999 which are divisible by both 2 and 5.

36. The sum of 5^{th} and 9^{th} terms of an A.P. is 30. If its 25^{th} term is three times its 8^{th} term, find the A.P.

37. If m times the m^{th} terms of an A.P. is equal to n times of n^{th} term and $m \neq n$, show that its $(m+n)^{th}$ term is zero. **(CBSE 2014)**

38. Which term of the A.P. 3, 15, 27, 39 .... will be 120 more than its 21^{st} term?
(CBSE 2018)

39. The sum of first n terms of an A.P. is given by $S_n = 3n^2 + 2n$. Find the A.P.
(CBSE 2022)

40. In an A.P., the first term is 12 and the common difference is 6. If the last term of the A.P. is 252, then find its middle term. **(CBSE 2022)**

41. The 17^{th} term of an A.P. is 5 more than twice its 8^{th} term. If the 11^{th} term of the A.P. is 43, then find the n^{th} term of the A.P. **(CBSE 2020)**
(NCERT)

42. If the sum of the first 14 terms of an A.P. is 1050 and its fourth term is 40, find its 20^{th} term. **(CBSE 2020)**

43. Find the number of terms in the series $20+19\frac{1}{3}+18\frac{2}{3}+...$ of which the sum is 300, explain the double answer. **(NCERT)**

44. Find the sum of n terms of the series: $\left(4-\frac{1}{n}\right)+\left(4-\frac{2}{n}\right)+\left(4-\frac{3}{n}\right)+...$

(CBSE 2017)

LONG ANSWER TYPE QUESTIONS

45. The sum of third and seventh terms of an A.P. is 6 and their product is 8. Find the sum of first 16 terms of the A.P.

46. Determine the A.P. whose 4^{th} term is 18 and the difference of 9^{th} term from the 15^{th} term is 30.

47. The sum of first 9 terms of an A.P. is 162. The ratio of its 6^{th} term to its 13^{th} term is 1:2. Find the first and fifteenth terms of the A.P.

48. The sum of the first 9 terms of an A.P. is 171 and the sum of its first 24 terms is 996. Find the first term and common difference of the A.P. **(CBSE 2020)**

49. The sum of first 7 terms of an A.P. is 63 and the sum of its next 7 term is 161. Find the 28^{th} term of this A.P.

50. If the sum of the first four terms of an AP is 40 and the sum of the first fourteen terms of an AP is 280. Find the sum of first n terms of the A.P. **(CBSE 2018)**

51. A man saved ₹ 16500 in ten years. In each year after the first he saved ₹ 100 more than he did in the preceding year. How much did he save in the first year?

52. In an AP of 50 terms, the sum of first 10 terms is 210 and the sum of last 15 terms is 2565. Find the A.P. **(CBSE 2014)**

53. The sum of first n terms of an A.P. is $5n^2 + 3n$. If the m^{th} term is 168, find the value of m. Also find the 20^{th} term of the A.P. **(CBSE 2013)**

54. If the 4^{th} term of an A.P. is zero, prove that the 25^{th} term of the A.P. is three times its 11^{th} term. **(CBSE 2016)**

55. In an A.P. if $S_5 + S_7 = 167$ and $S_{10} = 235$. Find the A.P., where S_n denotes the sum of its first n terms. **(CBSE 2015)**

56. In an A.P. prove $S_{12} = 3\,(S_8 - S_4)$ where S_n represent the sum of first n terms of an A.P. **(CBSE 2015)**

57. The sum of four consecutive numbers in A.P. is 32 and the ratio of the product of the first and last term to the product of two middle terms is 7 : 15. Find the numbers.

58. Find the sum of first 16 terms of an Arithmetic Progression whose 4^{th} and 9^{th} terms are –15 and –30 respectively. **(CBSE 2020)**

59. An A.P. consists of 37 terms. The sum of the three middle most terms is 225 and the sum of the last three terms is 429. Find the A.P.

ANSWERS AND HINTS

VERY SHORT ANSWER TYPE QUESTIONS-I

1. $a_n = 3n - 5 \qquad a_5 = 10$

2. $S_n = \frac{10}{2}\,[2 \times 2 + 9 \times 2] = 110$

3. 1, 3, 5, ...

$a_n = 1 + (n - 1)2 = 2n - 1.$

4. $1 + 2 + ... + n = \frac{n}{2}\,[1 + n]$

5. $2 + 4 + 6 + ... + 2n = \frac{n}{2}[2 + 2n] = n(n + 1)$

6. $a_n = a + (n - 1)d = -5(n + 1)$

7. $d = a_2 - a_1 = \frac{1}{9}$

8. $a_1 = 3 + 7 = 10,\ a_2 = 6 + 7 = 13,\ d = 3$

9. $(a + 7d) - (a + 3d) = 4d = 20$

10. $a_{16} = a + 15d = -40$